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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,935	06/27/2003	Takafumi Terahara	1344.1120	4453

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EXAMINER
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LI, SHI K

ART UNIT	PAPER NUMBER
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2613

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/01/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/606,935	TERAHARA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Shi K. Li	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 December 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-18,20,22 and 25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-18,20,22 and 25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Allowable Subject Matter***

1. The indicated allowability of claims 2-12 and 16 is withdrawn in view of the newly discovered reference(s) to Bigo et al. and Miyamoto et al. Rejections based on the newly cited reference(s) follow.

### ***Claim Rejections - 35 USC § 112***

2. Claims 18, 20 and 22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 18 recites the limitation "filter having a band narrower than spectrum width obtained based on a bit rate and a type of coding of each of said optical signals" in lines 3-4 of the claim. However, instant specification does not teach how to obtain a spectrum width based on a bit rate and a type of coding and, therefore, one skilled in the art cannot determine the bandwidth of the filter. That is, the specification does not describe the limitation in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 20 recites the limitation "filter having a band narrower than spectrum width obtained based on a bit rate and a type of coding of each of said optical signals" in lines 4-5 of the claim. However, instant specification does not teach how to obtain a spectrum width based on a bit rate and a type of coding and, therefore, one skilled in the art cannot determine the bandwidth of the filter. That is, the specification does not describe the limitation in such a way

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as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 22 recites the limitation "filter having a band narrower than spectrum width obtained based on a bit rate and a type of coding of each of said optical signals" in lines 3-4 of the claim. However, instant specification does not teach how to obtain a spectrum width based on a bit rate and a type of coding and, therefore, one skilled in the art cannot determine the bandwidth of the filter. That is, the specification does not describe the limitation in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

3. Claim 25 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 25 recites the limitation "an order of the secondary gaussian". Instant specification does not teach "an order of the secondary gaussian". Therefore, instant specification does not describe the claimed subject matter in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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5. Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22 recites the limitation "a plurality of wavelengths" in line 2 of the claim and "a plurality of wavelengths" in lines 17-18 of the claim. It is unclear whether they refer to the same or different set of wavelengths. Claim 22 recites "said spectrum width" in line 24 of the claim and "spectrum width" in line 3 and line 19. It is unclear to which spectrum width it refers. It is also unclear whether the "spectrum width" of line 3 and that of line 19 are the same or different.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. (S. Bigo et al., "Improving Spectral Efficiency by Ultra-Narrow Optical Filtering to Achieve Multi-Terabit/s Capacities", OFC 2002, 17-22 March 2002) in view of Miyamoto et al. (U.S. Patent 6,865,348 B2).

Regarding claims 1 and 17, Bigo et al. teaches in the first paragraph of the *Introduction* WDM transmission system in which signal lights with different wavelengths are multiplexed (see FIG. 1). Bigo et al. teaches in the first paragraph of *Centered filters in transmitter* demultiplexing and receivers at the receiving end. Bigo et al. teaches both NRZ and RZ signal format (see FIG. 1). Bigo et al. teaches in first paragraph of *Centered filters in transmitter*

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inserting centered optical filters at the transmitting end before wavelength multiplexing (see FIG.

1) for improving spectrum efficiency. The difference between Bigo et al. and the claimed

invention is that Bigo et al. does not teach super-Gaussian filters. However, super-Gaussian

filters are well known in the art. For example, Miyamoto et al. teach in FIG. 2B optical filter 82.

Miyamoto et al. teaches in FIG. 44D and col. 30, lines 50-55 super-Gaussian filter of order  $m$ .

One of ordinary skill in the art would have been motivated to combine the teaching of Miyamoto

et al. with the WDM transmission system of Bigo et al. because a super-Gaussian filter with

order  $m > 1$  gives high suppression ratio for crosstalk. Thus it would have been obvious to one of

ordinary skill in the art at the time the invention was made to use super Gaussian or order  $m > 1$ ,

as taught by Miyamoto et al., in the transmission system of Bigo et al. because a super-Gaussian

filter with order  $m > 1$  gives high suppression ratio for crosstalk.

8. Claims 3-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al.

and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Frankel et al.

(U.S. Patent 6,496,297 B1).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17.

The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et

al. and Miyamoto et al. do not teach that the spectrum efficiency is 0.574 bit/s/Hz. However,

spectrum efficiency is an engineering figure which depends on many factors. For example,

Frankel et al. teaches in col. 5, line 51 spectral efficiency of 0.7 bits/s/Hz and teaches in col. 5,

line 59-60 that spectrum efficiency may be increased to 1 bit/s/Hz. Literature in the art teaches

various spectrum efficiency values and, therefore, specifying a particular value or a particular

range of values is not patentable.

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Regarding claim 4, given maximum spectral efficiency 0.574 bits/s/Hz, grid I and bit rate B, it is obvious that  $B/(kI)$  is the actual spectrum efficiency and  $B/(kI)$  must be smaller than or equal to 0.574 bit/s/Hz. The smallest k such that  $B/(kI) < 0.574$  bit/s/Hz is the minimum value for k.

Regarding claims 5 and 7, if B/I is 1.6 bit/s/Hz, k=1 gives a spectral efficiency of 1.6 bit/s/Hz which is not possible, k=2 gives a spectrum efficiency of 0.6 which is also not possible while k=3 gives a spectrum efficiency of 0.53 which is less than the maximum value.

Regarding claim 6, for I of 25 GHz, frequency spacing is  $kI = 75$  GHz.

Regarding claim 8, set  $\Delta f = 75$  GHz and  $f_b = 40$  to 50 GHz give their ratio as 1.875 and 1.50.

Similar arithmetic gives results of claims 9-12.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Ramaswami et al. ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et al. and Miyamoto et al. do not teach arrayed waveguide grating. Ramaswami et al. teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the

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invention was made to use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. as an engineering design choice.

10. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Frankel et al. as applied to claims 3-12 above, and further in view of Ramaswami et al. ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al., Miyamoto et al. and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al. and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Frankel et al. do not teach arrayed waveguide grating. Ramaswami et al. teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice.

Note that interleaver using an interference filter is well known in the art. For example, see Gu (U.S. Patent 6,611,340 B2).



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11. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Frankel et al. as applied to claims 3-12 above, and further in view of Koshi (U.S. Patent Application Pub. 2002/0025111 A1).

Bigo et al., Miyamoto et al. and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al. and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Frankel et al. do not teach dielectric multi-layer film filter. Koshi teaches in FIG. 2 a wavelength multiplexer 2. Koshi teaches in paragraph [0099] that Mach-Zehnder interferometer type wavelength multiplexer, arrayed waveguide grating or dielectric multi-layer filter can be used for multiplexer 2. One of ordinary skill in the art would have been motivated to combine the teaching of Koshi with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a dielectric multi-layer film filter as multiplexer/demultiplexer, as taught by Koshi, in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice.

12. Claims 16 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Guy (U.S. Patent 6,690,886 B1).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et al. and Miyamoto et al. do not teach calculating spectrum efficiency at which a performance index is maximized. However, Guy teaches in col. 3, lines 39-48 and col. 6, lines 25-35 that

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spectrum efficiency is a compromise between channel spacing and degradation of signal quality caused by effects such as crosstalk. Therefore, it is obvious for one of ordinary skill in the art to minimize degradation and channel spacing, i.e., maximizing  $(B/S)$  and  $1/\Delta Q$ .

Regarding claim 25, instant specification admits that when the performance index is maximized, the product of a transmission distance and a transmission capacity is also maximized.

13. Claims 18, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Silberberg et al. (U.S. Patent 7,7035,484 B2).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et al. and Miyamoto et al. do not teach polarization independent filter. Silberberg et al. teaches in col. 14, lines 9-12 and col. 15 lines 43-54 to make filter polarization independent for applications that do not use any particular polarization arrangement because polarization is random if there lacks any polarization control. One of ordinary skill in the art would have been motivated to combine the teaching of Silberberg et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. because using polarization independent filters does not require any particular polarization control. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use polarization independent filters, as taught by Silberberg et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. because using polarization independent filters does not require any particular polarization control.

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***Response to Arguments***

14. Applicant's arguments with respect to claims 1, 3-18, 20, 22 and 25 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (8:30 a.m. - 5:00 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

skl  
25 February 2007



**SHI K. LI**  
**PRIMARY PATENT EXAMINER**